



Underwriters
Laboratories

Test report No. : 31EE0097-HO-01-B
Page : 1 of 19
Issued date : March 4, 2011
FCC ID : ZBQVEHICLEMCOM

RADIO TEST REPORT

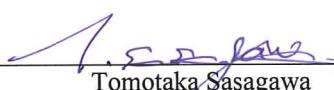
Test Report No. : 31EE0097-HO-01-B

Applicant : Muratec Automation Co.,LTD
Type of Equipment : MCOM: Merge/divergecommunication Modem
Model No. : MCOM
FCC ID : ZBQVEHICLEMCOM
Test regulation : FCC Part 15 Subpart C: 2010
Test Result : Complied

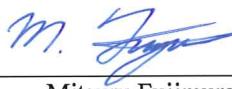
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3. This sample tested is in compliance with above regulation.
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Date of test: January 10, 2011

**Representative
test engineer:**


Tomotaka Sasagawa
Engineer of WiSE Japan,
UL Verification Service

Approved by:


Mitsuru Fujimura
Manager of WiSE Japan,
UL Verification Service



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MF058b (12.01.11)

<u>CONTENTS</u>	<u>PAGE</u>
SECTION 1: Customer information	3
SECTION 2: Equipment under test (E.U.T.).....	3
SECTION 3: Test specification, procedures & results	4
SECTION 4: Operation of E.U.T. during testing.....	7
SECTION 5: Radiated emission (Fundamental and Spurious Emission).....	9
SECTION 6: -26dB Bandwidth.....	11
APPENDIX 1: Photographs of test setup	12
Radiated Emission.....	12
APPENDIX 2: Data of EMI test.....	13
Radiated Emission below 30MHz (Fundamental Emission)	13
Radiated Emission below 30MHz (Spurious Emission).....	15
Radiated Emission above 30MHz (Spurious Emission).....	16
-26dB Bandwidth.....	17
APPENDIX 3: Test instruments	19

SECTION 1: Customer information

Company Name : Muratec Automation Co.,LTD
Address : 100, Takegahana-cho, Ise-shi,Mie 516-0005, Japan
Telephone Number : +81-596-36-0856
Facsimile Number : +81-596-36-2162
Contact Person : Hiromichi Kawashima

SECTION 2: Equipment under test (E.U.T.)

2.1 Identification of E.U.T.

Type of Equipment : MCOM: Merge/divergecommunication Modem
Model No. : MCOM
Serial No. : Refer to Section 4, Clause 4.2
Receipt Date of Sample : January 7, 2011
Country of Mass-production : Japan
Condition of EUT : Production model
(Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT : No Modification by the test lab

2.2 Product Description

Model No: MCOM (referred to as the EUT in this report) is the MCOM: Merge/divergecommunication Modem.

Clock frequency(ies) in the system : 24MHz

	353.25kHz (Tx)/ 300.33kHz (Rx)	88.8kHz
Equipment Type	Transceiver	Transceiver
Frequency of Operation	353.25kHz two level FSK	88.8kHz
Type of Modulation	FSK	ON/OFF KEYING (88.8kHz (on/off Keying))
Antenna Type	Coil antenna	Coil antenna
Power supply	DC24V	DC24V

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SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C: 2010, final revised on December 6, 2010 and effective January 5, 2011

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators Section 15.209 Radiated emission limits, general requirements

FCC 15.31 (e)

This EUT provides stable voltage (DC +24V, DC+5V, DC \pm 12V) constantly to RF module regardless of input voltage. Therefore, this EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

It is impossible for end users to replace the antenna, because the antenna is mounted inside of the EUT. Therefore, the equipment complies with the antenna requirement of Section 15.203.

3.2 Procedures and results

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
1	Conducted Emission	ANSI C63.4:2003 7. AC powerline conducted emission measurements	Section 15.207	-	N/A *1)	N/A	N/A
2	Electric Field Strength of Fundamental Emission	ANSI C63.4:2003 13. Measurement of intentional radiators	Section 15.209	Radiated	N/A 33.8dB (0.08880MHz, AV, 0deg.) 20.1dB (0.35325MHz, AV, 0deg.)	33.8dB (0.08880MHz, AV, 0deg.) 20.1dB (0.35325MHz, AV, 0deg.)	Complied
3	Electric Field Strength of Spurious Emission	ANSI C63.4:2003 13. Measurement of intentional radiators	Section 15.209	Radiated	N/A 0.4dB (72.702MHz, Vertical, QP)	0.4dB (72.702MHz, Vertical, QP)	Complied
4	-26dB Bandwidth	ANSI C63.4:2003 13. Measurement of intentional radiators	Reference data	Radiated	N/A	N/A	N/A

Note: UL Japan, Inc.'s EMI Work Procedures No.QPM05 and QPM15.

*1) The test is not applicable since the EUT is not the device that is designed to be connected to the public utility (AC) power line.

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3.3 Addition to standard

No addition, exclusion nor deviation has been made from the standard.

3.4 Uncertainty

EMI

The following uncertainties have been calculated to provide a confidence level of 95% using a coverage factor k=2.

Test room (semi- anechoic chamber)	Radiated emission (10m*)(±dB)		
	9kHz -30MHz	30MHz -300MHz	300MHz -1GHz
No.1	3.3dB	5.2dB	5.2dB
No.2	-	-	-
No.3	-	-	-
No.4	-	-	-

*10m = Measurement distance

Test room (semi- anechoic chamber)	Radiated emission						
	(3m*)(±dB)				(1m*)(±dB)		(0.5m*)(±dB)
	9kHz -30MHz	30MHz -300MHz	300MHz -1GHz	1GHz -10GHz	10GHz -18GHz	18GHz -26.5GHz	26.5GHz -40GHz
No.1	3.5dB	5.1dB	5.2dB	4.8dB	5.1dB	4.4dB	4.3dB
No.2	4.0dB	5.1dB	5.2dB	4.8dB	5.0dB	4.3dB	4.2dB
No.3	4.2dB	4.7dB	5.2dB	4.8dB	5.0dB	4.5dB	4.2dB
No.4	4.0dB	5.0dB	5.1dB	4.8dB	5.0dB	5.1dB	4.2dB

*3m/1m/0.5m = Measurement distance

Radiated emission test (3m and 10m)

The data listed in this report meets the limits unless the uncertainty is taken into consideration.

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3.5 Test Location

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	FCC Registration Number	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms
No.1 semi-anechoic chamber	313583	2973C-1	19.2 x 11.2 x 7.7m	7.0 x 6.0m	No.1 Power source room
No.2 semi-anechoic chamber	655103	2973C-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 semi-anechoic chamber	148738	2973C-3	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.3 Preparation room
No.3 shielded room	-	-	4.0 x 6.0 x 2.7m	N/A	-
No.4 semi-anechoic chamber	134570	2973C-4	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.4 Preparation room
No.4 shielded room	-	-	4.0 x 6.0 x 2.7m	N/A	-
No.5 semi-anechoic chamber	-	-	6.0 x 6.0 x 3.9m	6.0 x 6.0m	-
No.6 shielded room	-	-	4.0 x 4.5 x 2.7m	4.75 x 5.4 m	-
No.6 measurement room	-	-	4.75 x 5.4 x 3.0m	4.75 x 4.15 m	-
No.7 shielded room	-	-	4.7 x 7.5 x 2.7m	4.7 x 7.5m	-
No.8 measurement room	-	-	3.1 x 5.0 x 2.7m	N/A	-
No.9 measurement room	-	-	8.0 x 4.5 x 2.8m	2.0 x 2.0m	-
No.10 measurement room	-	-	2.6 x 2.8 x 2.5m	2.4 x 2.4m	-
No.11 measurement room	-	-	3.1 x 3.4 x 3.0m	2.4 x 3.4m	-

* Size of vertical conducting plane (for Conducted Emission test) : 2.0 x 2.0m for No.1, No.2, No.3, and No.4 semi-anechoic chambers and No.3 and No.4 shielded rooms.

3.6 Test set up, Data of EMI, and Test instruments

Refer to APPENDIX.

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SECTION 4: Operation of E.U.T. during testing

4.1 Operating Modes

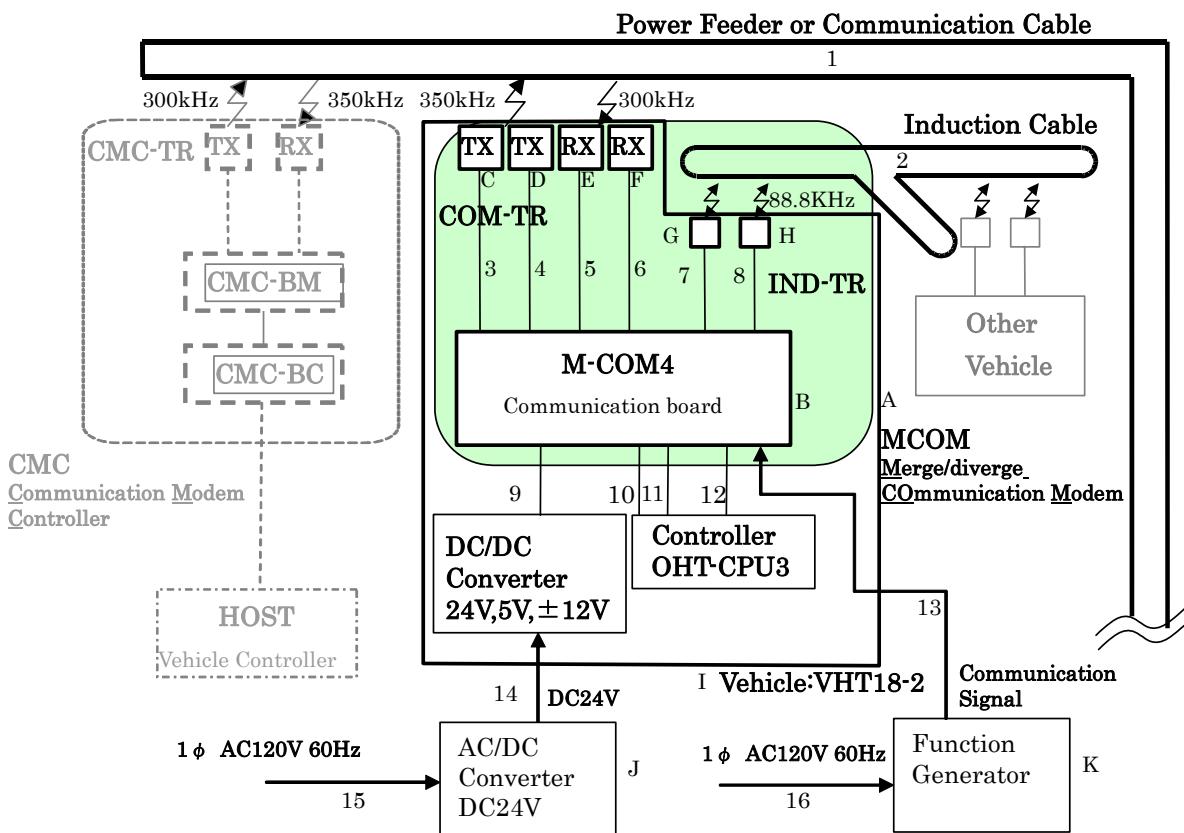
The EUT exercise Program used during radiated and conducted testing was designed to exercise the various system components in manner similar to typical use.

The operation mode/system were as follows:

Test mode	Remarks
Continuous transmitting (88.8kHz/On Off keying, and 353.25kHz/two level FSK) *EUT has the power settings by the software as follows: Power settings: DC+24V Software: P13036 *This setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product.	-

Justification : The system was configured in typical fashion (as a customer would normally use it) for testing.

4.2 Configuration and peripherals



* Cabling and setup were taken into consideration and test data was taken under worse case conditions.

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Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remark
A	MCOM: Merge/ divergecommunication Modem	MCOM	MCOM4-01	MURATEC AUTOMATION	EUT (Include B-H)
B	PCB:M-COM4	HM2-G2737-500	201010-001	MURATEC AUTOMATION	EUT
C	COM-TR(TX)	Z906792000	K10101001	MURATEC AUTOMATION	EUT
D	COM-TR(TX)	Z906792003	K10104001	MURATEC AUTOMATION	EUT
E	COM-TR(RX)	Z906792001	K10102001	MURATEC AUTOMATION	EUT
F	COM-TR(RX)	Z906792002	K10103001	MURATEC AUTOMATION	EUT
G	IND-TR	Z906846200	B1010-001	MURATEC AUTOMATION	EUT
H	IND-TR	Z906846300	B1010-002	MURATEC AUTOMATION	EUT
I	VEHICLE: OHT G2-3S	VHT18-2	VHT18-2-001	MURATEC AUTOMATION	-
J	DC24V Power Supply	PAB25-1TR	30081818	KIKUSUI	-
K	Function Generator	AFG3102	C011652	TEKTRONIX	-

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	Power Feeder	5.0	Unshielded	Unshielded	-
2	Induction Cable	5.0	Unshielded	Unshielded	-
3	Interconnection Cable	1.5	Shielded	Unshielded	-
4	Interconnection Cable	1.5	Shielded	Unshielded	-
5	Interconnection Cable	1.5	Shielded	Unshielded	-
6	Interconnection Cable	1.5	Shielded	Unshielded	-
7	Interconnection Cable	1.0	Shielded	Unshielded	-
8	Interconnection Cable	1.0	Shielded	Unshielded	-
9	Interconnection Cable	1.0	Unshielded	Unshielded	-
10	Interconnection Cable	1.0	Shielded	Unshielded	-
11	Interconnection Cable	1.0	Shielded	Unshielded	-
12	Interconnection Cable	1.0	Unshielded	Unshielded	-
13	Communication Signal Cable	3.0	Shielded	Unshielded	-
14	Power Supply Cable	3.0	Shielded	Unshielded	-
15	AC Power Supply Cable	2.0	Unshielded	Unshielded	-
16	AC Power Supply Cable	2.0	Unshielded	Unshielded	-

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SECTION 5: Radiated emission (Fundamental and Spurious Emission)

Test Procedure

The Radiated Electric Field Strength intensity has been measured on No 1 semi anechoic chamber with a ground plane and at a distance of 10m.

Frequency : From 9kHz to 30MHz at distance 10m

The EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.

The measurements were performed for vertical polarization (antenna angle: 0deg., 45deg., 90deg., 135 deg. and 180 deg.) and horizontal polarization.

*Refer to Figure 1 about Direction of the Loop Antenna.

Frequency : From 30MHz to 1GHz at distance 3m

The measuring antenna height varied between 1 and 4m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.

The measurements were performed for both vertical and horizontal antenna polarization.

Measurements were performed with a QP, PK, and AV detector.

The radiated emission measurements were made with the following detector function of the test receiver.

	From 9kHz to 90kHz and From 110kHz to 150kHz	From 90kHz to 110kHz	From 150kHz to 490kHz	From 490kHz to 30MHz	From 30MHz to 1GHz
Detector Type	PK/AV	QP	PK/AV	QP	QP
IF Bandwidth	200Hz	200Hz	9kHz	9kHz	120kHz

The test was made on EUT at the normal use position.

* Part 15 Section 15.31 (f)(2) (9kHz-30MHz)

[Limit at 10m]=[Limit at 300m]-40 x log (10[m]/300[m])

[Limit at 10m]=[Limit at 30m]-40 x log (10[m]/30[m])

Test data : APPENDIX 2
Test result : Pass

Date: January 10, 2011

Test engineer: Tomotaka Sasagawa

UL Japan, Inc.

Head Office EMC Lab.

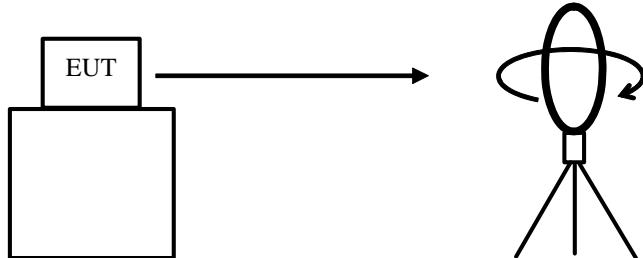
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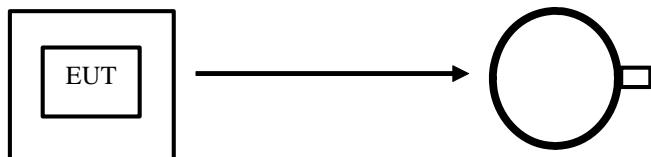
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Figure 1: Direction of the Loop Antenna

Side View (Vertical)

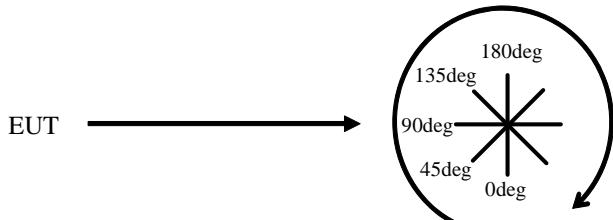


Top View (Horizontal)



Antenna was not rotated.

Top View (Vertical)



Front side: 0 deg.
Forward direction: clockwise

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SECTION 6: -26dB Bandwidth

Test Procedure

The measurement was performed in the antenna height to gain the maximum of Electric field strength.

Test	Span	RBW	VBW	Sweep	Detector	Trace	Instrument used
-26dB Bandwidth	100kHz	1kHz	3kHz	Auto	Peak	Max Hold	Spectrum Analyzer

Test data : APPENDIX 2

Test result : Pass

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